

Claims:

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1. (Original) Apparatus for determining the remineralization ability of hard tissue, in particular carious dental tissue, characterized by a measuring device (46, 60, 86, 88; 104, 114, 116, 86, 88; 130-40, 88; 144-148, 88; 150-154, 88; 156, 86, 88; 158-174), for local measurement of at least one of the following physical, chemical or biological tissue properties: porosity, hardness, light absorption and light reflection, sound absorption and sound reflection, cellular structure, electrical conductivity, chemical changes in the tissue framework or chemical changes in fluid present in the tissue framework, invasion by bacteria.
2. (Original) Apparatus according to Claim 1, characterized in that the measuring device has a measuring head (40) with a rod-like, preferably cylindrical probe section (42) which comprises a measuring element (46, 60; 104, 116; 130, 134, 138; 144, 148; 150-154; 156; 158-170) responding to the physical, chemical or biological properties.
3. (Original) Apparatus according to Claim 2, characterized by a position indicator (48-52) for the axial position of the probe section (42) in relation to a contour surface of the tissue.
4. (Original) Apparatus according to Claim 3, characterized in that the probe position indicator (48-52) has an input part (48) which cooperates with the tissue surface and which is arranged axially displaceably on the probe section (42) and is supported by a spring (50) on a stationary apparatus section, to which spring a force or deformation sensor (52) is assigned.
5. (Currently Amended) Apparatus according to Claim 4, characterized by an evaluation unit (88) which receives the output signals of the probe position indicator (48-52) and the output signals of the measuring element, and compares the output signals from the latter, which are obtained when the positions of the probe section (42) differs, with one another, for which purpose the measured signals obtained for each of the different probe positions are stored as a function of the output signals from the probe position indicator (48-52).

6. (Currently Amended) Apparatus according to ~~any of Claims 2-5~~, Claim 89, where the measuring element has a radial measuring axis, relative to the axis of the probe section (42), characterized in that the probe section (42), is arranged rotatably (118-122) on the measuring head (40).
7. (Currently Amended) Apparatus according to ~~any of Claims 2-6~~, Claim 89, characterized in that the measuring head (40) is attached to a grip part (36), with it preferably being rotatable about its long axis.
8. (Original) Apparatus according to Claim 7, characterized in that the long axis of the grip part (36) and the axis of the measuring head (40) are inclined with respect to one another and preferably include an angle between about 30° and about 90°, once again preferably of about 60°.
9. (Currently Amended) Apparatus according to Claim 7 ~~or 8~~, characterized in that the grip part (36) is connected via a rotating joint (99) to a supply cable (101).
10. (Currently Amended) Apparatus according to ~~any of Claims 1-9~~, Claim 89, characterized in that the measuring device has a first sensor part (104; 130, 138; 144; 150-54; 158, 160) acting on the tissue and a second sensor part (116; 130, 134; 148; 150-154; 164-170) measuring the response of the tissue to the stimulus, and in that means for adjusting the strength of the action produced by the first sensor part are provided.
11. (Original) Apparatus according to Claim 10, characterized in that the adjusting means comprise an input device (94) carried by the grip part (36).
12. (Currently Amended) Apparatus according to Claim 10 ~~or 11~~, characterized in that the adjusting means comprise a program control (88).
13. (Original) Apparatus according to Claim 12, characterized in that the program control operates so that the acting sensor part (104; 130, 138; 144; 150-54; 158, 160) is stimulated so

that a preset output signal is obtained at the recording sensor part (116; 130, 134; 148; 150-154; 164-170).

14. (Currently Amended) Apparatus according to ~~any of Claims 2-13~~, Claim 89, characterized in that the measuring head (40) has a sealing element (54) which cooperates with a section of the tissue surface, and in that the measuring head (40) is connected to a fluid source (76; 80) which is under a pressure different from normal pressure, and the measuring device measures the fluid leakage through the tissue to be investigated.

15. (Original) Apparatus according to Claim 14, characterized in that the fluid is a gas and in that the measuring head (40) can be connected via an on-off valve (62) which has a closed position to the fluid source (76; 80), and a pressure gauge (60) is connected to the measuring chamber which is limited by the measuring head (40) and the tissue.

16. (Original) Apparatus according to Claim 15, characterized in that the measuring head (40) has a pressure reservoir (58) connected to the measuring chamber.

17. (Original) Apparatus according to Claim 14, characterized in that the diagnostic fluid is a liquid and in that a flow meter (66) is arranged in the supply line leading from the fluid source (76) to the measuring head (40).

18. (Original) Apparatus according to Claim 17, characterized in that the flow meter (66) has a capillary tube and means for feeding gas bubbles into the downstream end of the capillary tube.

19. (Currently Amended) Apparatus according to ~~any of Claims 14-18 in conjunction with Claim 4~~, Claim 89, characterized in that the sealing element (54) is carried by the free front surface of the input part (48) of the probe position indicator (48-52).

20. (Currently Amended) Apparatus according to ~~any of Claims 14-18 in conjunction with Claim 2~~, Claim 89, characterized in that the probe section (42) is a cylindrical pipe which is closed at the end (44) and which has at least one fluid emergence orifice in its peripheral wall.

21. (Original) Apparatus according to Claim 20, characterized in that the probe section (42) has at its end remote from the free end a preferably conical shoulder (274) which expands in the radial direction, and in that a sealing tube (276) is arranged on the outside of the probe section (42) and can be pushed with its end which is remote from the free end of the probe section (42) onto the sealing shoulder (274) with widening.

22. (Currently Amended) Apparatus according to ~~any of Claims 14-21~~, Claim 89, characterized in that the measuring head (40) can be connected by a reversing valve (72) alternately to a positive pressure fluid source (76) and a negative pressure fluid source (80).

23. (Currently Amended) Apparatus according to Claim 22 ~~in conjunction with Claim 17~~, characterized by means (102) for collecting the liquid volume aspirated from the measuring head (40).

A/ 24. (Currently Amended) Apparatus according to ~~any of Claims 1-13~~, Claim 89, characterized in that the measuring head (40) has a measuring point (104) which can be extended.

25. (Currently Amended) Apparatus according to Claim 24 ~~in conjunction with Claim 2~~, characterized in that the measuring point (104) is carried by a lever (108) which can be pivoted by an actuating rod (112) running in the lengthwise direction of the probe section (42) so that the measuring point (104) is moved with a radial movement component through a window (106) of the probe section (42).

26. (Currently Amended) Apparatus according to Claim 24 ~~in conjunction with Claim 2~~, characterized in that the measuring point is carried by a flexible transmission element (124) which is guided in a guide (126) in the probe housing (128) so that the transmission element (124) emerges with a radial direction component from the probe housing (128).

27. (Currently Amended) Apparatus according to Claim 25 ~~or 26~~, characterized in that the actuating rod (112) is moved by a motor operator (114) whose driving force is adjustable (74).

28. (Currently Amended) Apparatus according to ~~any of Claims 1-13~~, Claim 89, characterized in that the measuring head (40) comprises a light source (138), an optical system (130, 132) and an image converter (134).

29. (Currently Amended) Apparatus according to ~~any of Claims 1-13~~, Claim 89, characterized in that the measuring head (40) comprises a measuring light source (160), where appropriate an optical system and at least one color filter (168) and a light detector (170).

30. (Currently Amended) Apparatus according to ~~any of Claims 1-13~~, Claim 89, characterized in that the measuring device has a vibrator (144), a generator (146) operating on the vibrator, and means (148) for measuring the damping of the vibrator.

31. (Currently Amended) Apparatus according to ~~any of Claims 1-13~~, Claim 89, characterized in that the measuring device has a vibrator (144), an intermittently operating generator (146) operating on the vibrator (144) and a receiver (144) for vibrations reflected from the tissue, and means (88) for evaluating the intensity of the reflected vibrations.

32. (Currently Amended) Apparatus according to ~~any of Claims 1-13~~, Claim 89, characterized in that the measuring device has spaced electrodes (150, 152) which are connected to a resistance or impedance measuring unit (154) or represent part of a vibration circuit which is connected to a frequency measuring unit.

33. (Currently Amended) Apparatus according to ~~any of Claims 1-13~~, Claim 89, characterized in that the measuring device has a micro-porous test tube (156) or a hollow drill whose interior can be connected to a negative pressure source (80).

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89. (New) Apparatus for determining the remineralization ability of a hard tissue with a measuring device (46, 60, 86, 88; 104, 114, 116, 86, 88; 130-140, 88; 144-148, 88; 150-154, 88; 156, 86, 88; 158-174) for local measurement of a physical property of the hard tissue,

wherein

the measuring device has a measuring head (40) with a rod-like probe section (42), which probe section (42) is introducible into a working channel (32) of the hard tissue and comprises a measuring element (46, 60; 104, 116; 130, 134, 138; 144, 148; 150-154) being connected to the probe section (42) and responding to the physical property of porosity of the hard tissue, wherein the measuring head (40) has a sealing element (54) which cooperates with a section of the tissue surface, and the measuring head (40) is connected to a fluid source (76; 80) which is under a pressure different from normal pressure, and the measuring device measures the fluid leakage through the tissue to be investigated.

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